ABWR
Severe Accident Mitigation

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INPRO Criteria Evaluated:

• IN 1.4.1 Calculated frequency of major release of radioactive materials into the containment
• IN 1.4.2 Processes for controlling parameters and activity levels in containment
IN 1.4.1 Frequency of major release of radioactive materials into containment

Acceptance Limit: The calculated frequency of a highly degraded core is well below the recommended value by IAEA of $10^{-5}$ per unit-year
IN 1.3.1: Calculated frequency of occurrence of design basis accidents

Example 1: Comparison of Core Damage Frequencies

Internal Events CDF

- Existing Regulatory Goal: $1.00 \times 10^{-04}$
- Reference BWR: $5.00 \times 10^{-06}$
- ABWR: $2.00 \times 10^{-07}$
- ESBWR: $1.80 \times 10^{-08}$
Acceptance Limit:
In a state with a highly degraded core, active or passive engineered processes or natural processes should be available to reduce the load on the containment barrier and to reduce and/or control the activity in the containment atmosphere. Such mechanisms are included in the NES design.
Emergency Core Cooling System

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>TYPE</th>
<th>NO. DIVS.</th>
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</thead>
<tbody>
<tr>
<td>HIGH PRESSURE CORE FLOODER</td>
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<td>REACTOR CORE ISOLATION COOLING</td>
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<td>LOW PRESSURE FLOODER</td>
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<td>SUPRESSION POOL COOLING</td>
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<td>DRYWELL SPRAY</td>
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<td>SHUTDOWN COOLING</td>
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<tr>
<td>FUEL POOL COOLING SUPPORT</td>
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</table>
Severe Accident Features

ABWR passive features which mitigate severe accidents:

- Inerted Containment
- Lower Drywell flood capability
- Lower Drywell special concrete & sump protection
- Suppression pool - fission products scrubbing & retention
- Containment overpressure protection
- Passive Autocatalytic Recombiners (PARS) are under consideration
AC Independent Water Addition (ACIWA)

Hard piped fire water connections
Seismic Category 1
On-site fire protection system connection
Truck connection
  • Ties to RHR C
References

ABWR

Design Certification Document, Rev. 4:
http://www.nrc.gov/reactors/new-reactors/design-cert/abwr.html#dcd

Safety Evaluation Report, NUREG-1503 and NUREG-1503 Supplement 1:
http://pbadupws.nrc.gov/docs/ML0806/ML080670592.html

Design Certification Rule, 10CFR52 Appendix A:

Revision 5 of the ABWR DCD can be found here:
http://pbadupws.nrc.gov/docs/ML1100/ML110040323.html

Reference BWR (Grand Gulf NPP) NUREG-1150
http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1150/